EFFECTS OF PHOTOPOLLUTION ON CIRCADIAN ACTIVITY RHYTHMS

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Many aspects of organismal behavior and metabolism are modulated by biological clocks that oscillate with 24-hour (circadian) rhythms. These circadian clocks synchronize to environmental cues, such as cycles of light and dark, and allow organisms to anticipate changing environmental conditions and make use of temporal niches. The circadian clocks' function, as well as the biological processes they modulate, can be altered by excess artificial lighting (photopollution). Photopollution levels in Chicago are some of the highest in the world, making it an ideal location to investigate the ecological and health impacts of nighttime light. While photopollution's effects on specific species (*e.g.* sea turtles) have been well documented, research across wider, urban populations is limited. Using a combination of laboratory and field studies, we examined the effects of relevant nighttime light levels on circadian rhythms in two model organisms: *Drosophila melanogaster* (fruit flies) and *Mus musculus (*house mice). Activity patterns were analyzed using TriKinetics activity monitors and running wheels with Clocklab data collection software, respectively. For both species locomotor activity was collected continuously for the duration of the experiments and levels of nighttime light were manipulated to replicate levels of photopollution found in the Chicagoland area (0 to 36 lux). Significant activity pattern differences were found for both species. Specifically, nighttime light changed total activity, the length of the active phase, and the amplitude of the activity rhythm in both species. In addition, field data on 12 wildlife species were collected from 83 camera traps (provided by the Urban Wildlife Institute at the Lincoln Park Zoo) across the Chicago metropolitan area. Photographic information was combined with data from satellite imagery to develop 24-hour activity profiles, and analyze for variations in activity based on nighttime light levels and season. Results show that nocturnal animals' total activity and duration of the active period decreased with the introduction of nighttime light. Taken together, these data demonstrate that the effects of photopollution are far reaching and can impact a variety of organisms. By combining both laboratory and field data, we hope to better understanding the varying impacts of photopollution and expand our understanding of the anthropogenic effects of artificial nighttime light on circadian clocks, behavior, and the environment.